

ABSTRACT SUBMITTED TO THE SPACECRAFT STRUCTURES
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DEVELOPMENTS IN ADAPTIVE STRUCTURES SINCE 1991

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At the 1991 Spacecraft Structures and Mechanical Testing conference held in Noordwijk, two papers by the authors were presented on the developments of Adaptive Structures at the Jet Propulsion Laboratory (JPL). The proposed paper(s), either one or two papers, is to present the developments in Adaptive Structures related to spacecraft in the US with emphasis on activities at JPL. The paper(s) will emphasize the potential benefits, developments on actuators, results from ground tests, and the developments of flight experiments and applications.

Future challenges of precision space structures are:

- o to improve the reliability of its deployment/assembly in space,
- o to validate the structural system by ground tests,
- o to meet the precision structural requirements during its 20-30 year lifetime,
- o to add redundancy to the mechanical system.

The recognition of these challenges are partially a result of recent flight occurrences on the solar array and mirror of the Hubble Space Telescope, Ulysses, and Galileo.

"Quality is a virtue to design. The on-line manufacturing process. . . . An inherent lack of robustness in a product design is the primary driver of superfluous manufacturing expenses." Introducing robustness into the structural design reduces cost while increasing reliability. The authors believe that introducing robustness into the structural design using Adaptive Structures help meets the otherwise unresolvable technical challenges while reducing overall cost and improving reliability for both large precision and small structures.

Adaptive Structures are systems whose geometric and physical structural characteristics can be beneficially modified to meet

mission requirements either through remote commands or automatically in response to internal or external stimulations.

Recent developments in attenuating vibrations by 5,000 to control displacement. to 10nm, activities to eliminate joint gaps and statically adjust the surface of an antenna truss, summary of recent actuators, role of SMA, active fold mirror for WFPC, activities on vibration isolation, and development of 3-5 experiments on Adaptive Structures will be included in the presentation.

In the past three years, the activities in Adaptive Structures have increased dramatically. Three separate conferences, one Forum, many sessions at numerous conferences, two Journals, and several workshops have been initiated.